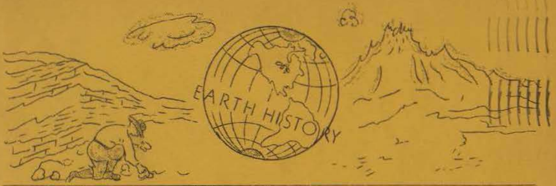

THE MINNESOTA GEOLOGIST

OFFICIAL BULLETIN OF THE GEOLOGICAL SOCIETY OF MINNESOTA

VOL. XI SPRING 1954 SUMMER NO. 1

CONTENTS

GEOLOGICAL SOCIETY OF MINNESOTA

MEETINGS: October to May inclusive, 7:30 P.M. every Tuesday not a holiday, Auditorium, Minnesota Museum of Natural History, University of Minnesota, 17th Ave. S. E. and University Avenue. Visitors welcome.

FIELD TRIPS: May until October inclusive.

Annual dues: Residents of Hennepin and Ramsey counties $ 3.00 plus $ 1.00 additional for husband, wife, or dependent family members; for students and non-residents, $ 1.00.

AFFILIATE MEMBER

MIDWEST FEDERATION OF MINERALOGICAL AND GEOLOGICAL SOCIETIES

and

THE AMERICAN FEDERATION OF MINERALOGICAL SOCIETIES

* Deceased

BULLETIN BOARD

THE GEOLOGICAL SOCIETY OF MINNESOTA
Tentative schedule for field trips for summer of 1954.

May 23. Platteville limestone, Shakopee dolomite, Jordan Sandstone. Three exposures in Minnesota from Twin Cities to St. Lawrence. Leaders: Mr. & Mrs. Henry Sommers.

June 6. Redwood Falls area. Leader: Charles Howard.

June 20. A study of the various strata and fossils of West Central Wis. as seen in the area contiguous to Spring Valley Wis. Leader: Hal E. McWethy.

July 17 to 31. Two week trip into Canada and New England States.

July 18. Agate hunt.

August 8. Picnic at Henry Sommers home on the St. Croix at Hudson.

August 22, 23. Lead and zinc mines. Iowa and southwestern Wisconsin. Leader: George Rickert.

September 18, 19. Duluth and North Shore. Leader: Bert Carlson.

October 23. St. Cloud, Little Falls, Cuyuana Iron Range. Minn. intrusives.

Changes may be necessary in the above program. Notices for each trip will be mailed a week in advance, giving the last minute details of route, transportation, etc.

Elmer Brown, Chairman,
Field Trip Program.

Aluminum has become such a common metal in our lives, that it should be interesting to study its occurance and uses. The element Aluminum is represented by the chemical symbol Al, the atomic number is 13, the atomic weight 26.97, density 2.6, it has a hardness of 3, melts at 660 dg. C., has no isotope and is bluish white in color. The metal was isolated by Wohler in 1827 and was a curosity until Hall and Theroult independently discovered a way of reducing the metal in 1886. In 1866 the metal could be bought in very limited quantity at $ 125 per pound, in 1913 the cost had dropped to 25 cents per pound. In tonnage as used in this country, the metal is now in fifth place Besides its use as a metal, its applications to the use of man in the form of its compounds is very wide.

(Because it is difficult to write chemical formulae on the typewriter, an attempt has been made to make them easier to read by separating the figures from the letters, ie Al203 will be Al 2 0 3.)

Before considering the uses of aluminum as a metal, let us study its occurance in nature. The element is third in quantity in the earth's crust: oxygen being 46.4%, silicon 27.5%, aluminum 8.08%. Aluminum is a constituent of all igneous rocks in the form of silicates - ie; feldspars, feldspathoids, and micas. Considerd as an oxide, Al 2 0 3, the percentages in the various rocks are:

INTRUSIVE ROCKS	EXTRUSIVE ROCKS
Granite 14.4%	Rhyolite 13.9%
Granodiorite 15.9	Dacite 16.2
Quartz diorite 16.2	Andesite 17.3
Gabbro 17.8	Basalt 15.7
Anorthosite 28.3	Phonolite 20.6

One of the pyroxenes, augite, with formula Ca (Mg Fe Al) (Si Al)2 0 6 is an essentail component of the fine grained plutonic rocks. The relatively high percentage of aluminum in these rocks will be very interesting when we consider the products of weathered igneous rocks.

Except for building stone, road material and aggregate the igneous rocks are not directly useful to us, but in some rocks called pegmatites, the feldspars and micas are coarsely crystalized and in this form the aluminum bearing minerals can be easily recovered for commercial use. Pegmatites are bodies of rock that have been intruded into fractures, faults and openings in the country rock, which cooled very slowly allowing large crystals to form. The feldspars are:

Potash feldspar K Al Si 3 0 8 Orthoclase
Soda feldspar Na Al Si 3 0 8 Albite plagioclase
Lime feldspar Ca Al Si 3 0 8 Anorthite

Potash feldspar is used in making pottery, soda feldspar in making glazes, as on bathroom fixtures. In glass making some feldspar is added to the melt as a souce of alumina, which increases the resistance of the glass to thermal and physical shock. Finely ground potash feldspar is the abrasive ingredient of scouring soaps and powders.

Micas are also a common constituent of pegmatites, the crystals forming in the manner of a book, often many inches across and inches thick. Muscovite, or white mica has the formula $K Al_3 Si_3 O_{10} (OH)_2$. Biotite, or dark mica contains in addition iron and magnesium $K (Mg, Fe)_3 Al Si_3 O_{10} (OH)_2$. The isenglass of stoves and heaters is a thing of the past, but far more mica is used today in the electrical industry for insulating purposes. To mention a few: insulation between commutator bars of electrical generators and motors, for support of the elements of radio vacuum tubes, and hot wire appliances. Scrap mica is used as a paint filler, in roofing materials, as a lubricant and as snow for Christmas decorating.

Associated with pegmatites are the garnets which also contain aluminum: Pyrope $Mg_3 Al_2 Si_3 O_{12}$, Almadine $Fe_3 Al_2 Si_3 O_{12}$, Spessarite $Mn_3 Al_2 Si_3 O_{12}$. Garnets are often prized as gem stones, but the most important use for the mineral is as an abrasive, garnet paper and garnet cloth being esteemed for its excellent cutting quality.

To cite a few of the many minerals which contain aluminum:

FELDSPATHOIDS.
Leucite $K Al Si O_6$
Nephelite $Na K (Al Si)_2 O_6$

SODALITES
Sodalite $Na_4 Al_3 Si_3 O_{12} Cl$
Lazurite $Na_4 Al_3 Si_3 O_{12} S$

SCAPOLITES
Maralite $Na_4 Al_3 (Al Si)_3 Si_6 O_{24}$
$(Cl\ CO_3\ SO_4)$

ZEOLITES
Stilbite $(Ca\ Na)_3 Al_5 (Al\ Si) Si_{14} O_{40}$
$(H_2O)_{15}$

Disilicates
Kaolin $Al_2 Si_2 O_5 (OH)_4$
Chlorite $(Mg\ Fe\ Al)_6 (Si\ Al)_4 (OH)_8$

Very important to our economy are the weathered minerals of the igneous rocks. As granites and basalts are broken down by chemical, physical and biological actions into their constituents of feldspars, quartz, micas, augite etc. the feldspars are further decomposed to clay minerals by the acid action of carbon dioxide dissolved in ground waters breaking down orthoclase into a hydrous aluminum silicate $Al_2 Si_2 O_5 (OH)_4$, kaolin, the potassium carbonate taken away in solution. From plagioclase the products are the same, except that sodium carbonate is removed in solution from albite, and calcium carbonate from anorthite. Kaolin, or china clay is a white crumbly substance when pure, and when washed away and redeposited it may be mixed with silica, compounds of iron and the carbonates of calcium and magnesium, becoming common clay.

Clays have a comparatively low melting point, so that it is possible to heat the molded and dried clay forms to a state of fusion which causes the particles to fuse together but not melt enough to change its shape.

This process of making a form from plastic material and then heating to make a strong, impervious, hard and insoluable product, makes possible an almost number of products. Pottery, drainage pipe, tile and brick are made from common clay, iron oxides giving the red color. During firing when the material has been properly fused the glazed surface is made by throwing salt into the kiln, hydrogen chloride is set free, so that the sodium hydroxide combines with the clay making a fusible sodum-aluminum-silicate covering the surface and sealing the pores.

China and porcelain are made from pure kaolin, free from iron, to which some feldspar has been added to lower the fusing point. After firing, the porcelains are glazed by painting the article with a paste of finely ground feldspar and silica after which the article is again fired. Decorative porcelain ware, statuettes, artificial teeth are some of the uses of porcelain. An immense amount of porcelain is used by the electrical industry as high tension insulators, mountings for switches, sockets etc. and as mountings for coils for hit wire heaters.

High refractory fire brick has aluminum oxide to the clay which gives a product that can withstand the higher temperatures of furnaces for steel making and the like.

Clay forms a part of soils and therefore is important as a source of our food supply.

OXIDE

Corundum Al 2 o 3. Corundum belongs to the hexagonal crystal system, is found in many colors, has a hardness of nine, specific gravity of 3.9, fracture conchoidal, breaks into sharp fragments. It is found in rocks poor in silicon oxide, with which the aluminum oxide would combine to a silicate if the silica were available. It is found in rocks of the nephline seyenite variety, and in pegmatites and schists. Corundum found as fine grained black disseminations with magnetite is called emery, which was an important industrail abrasive at the beginning of the century. Corundum is easy to synthesize by melting the powdered oxide. It crystallizes as soon as the molten oxide solidifies. The melting point of the oxide is 2050 C. The synthetic corundum is called alexite and alundum by the trade and is used in different sized grits for making grinding powders and wheels. The wheels are made by mixing the corundum grains with a low fusing clay, and after being formed to shape under pressure, are fired to partly fuse the matrix which holds the grains. The matrix, which is comparatively soft wears readily, allowing the sharp grains to be exposed at the surface. Because of its hardness, corundum is most useful for grinding hard steels. The use of corundum andcarborundum for grinding has made possible our modern accurate mass produced machinery, because grinding is fast and accurate and gives a fine smooth surface.

Large clear crystals of corundum are called ruby and sapphire. Although ruby and sapphire are thought of first as gems, they have a far more valuable use as bearings and styli. Ruby is the common mineral for watch jewels and sapphire is used as a stylus for cutting phonograph records and for reproducing. Corundum with a hardness of 9 is far softer than diamond, but still one of the hardest of minerals.

Next with a hardness of 8 is beryl, Be 3 Al 2 Si 6 0 18 found in pegmatites and used as an ore of berylium.

Topaz also with a hardness of 8 has the formula Al 2 Si 0 4 (F OH) 2.

Continuing with aluminum compounds, let us consider three more. Potassium aluminum sulphate (K 2 S O 4) Al 2 (S O 4)3, 24H 2 O is ordinary alum used as an astringent and for fireproofing fabrics. The crystals deposited in the fabric melt easily under fire and protect the fibers from sufficient oxygen to support combustion.

By adding calcium carbonate and aluminum sulphate to municipal water supplies, the gelatinous material of aluminum hydroxide causes foreign matter in the water to coalesce and precipitate rapidly, carrying with it most of the bacteria. Thus aluminum also plays a part in the purification of our drinking water.

Portland cement is made by heating limestone, clay and silica, resulting in a mixture of calcium silicate and calcium aluminate. The aluminate is hydrolyzed by water into calcium hydroxide and aluminum hydroxide. The calcium hydroxide slowly crystalizes connecting the particles of calcium silicate. The aluminum hydroxide fills the interstices and renders the whole compact and impervious.

Let us now return to the original igneous rocks being weathered and formed into hydrous aluminum silicates. Under certain conditions in tropical climates all the silica is removed from the feldspar, resulting in two aluminous minerals called bauxite, Al 2 O 3, H 2 O and Al 2 O 3, 3 H 2 O. These are the only workable ores of aluminum.

The metal is extracted in cells with carbon linings which form the cathode, the anode is also of carbon being in the form of rods which hang into the electrolyte. The aluminum oxide is dissolved in molten cryolite 3 Na F, Al F 3, melting point 1000 degrees. The molten metal, melting point 660 degrees, sinks to the bottom and is drawn off as it accumulates and fresh portions of the oxide being added.

Aluminum is processed by casting, rolling, drawing and extruding. The process of extrusion is forcing of the almost molten metal through an opening of prescribed size and shape in a die, the metal taking on the same shape.

The metal takes a high polish and is soon covered with a film of oxide which makes a protective covering. Aluminum is a good reflector being used at present in preference to silver for coating telescope mirrors. The process of coating glass with aluminum is by cathode sputtering in a vacuum. Aluminum is difficult to weld but by using the electric arc in a non-oxidizing atmosphere welding is very successful.

A small amount of copper alloyed with aluminum duralumin gives it great strength and being about one third as heavy as iron makes it a competitor of steel. Aluminum has a hardness of three and therefore is easily bent and dented. Stiffness against bending is obtained by corrugating and channeling.

Aluminum is not as good a conductor of electricity as copper, but weight for weight it will conduct more current, so that for long transmission lines aluminum is less expensive.

A method of making an attractive and durable finish on aluminum is to treat it electrolytically so that a coating of aluminum hydroxide is precipitated on the surface. This soft coating of hydroxide can then be dyed in any color or printed upon; after which the Hydroxide is dessicated leaving the oxide which makes a thin and very hard and durable coating in any color or design.

EDITOR'S NOTE: Four more bronze plaques depicting the geology of a given area have been erected in Minnesota this spring. To Mr. Lawrence King, Chairman of the Plaque Committee, we extend our gratitude and sincere appreciation. Among other things, he did the research for the legend and maps, prepared the text and spent a great deal of time scouting for suitable plaque sites. He was assisted by Mrs. King, Dr. Geo. A. Thiel, head of the Geology Department at the University of Minnesota, and Dr. Geo. M. Schwartz, Chairman of the Minnesota Geological Survey, and had the full cooperation of the State Highway Department and the Board of Park Commissioners. Following are the texts of the four plaques.

GEOLOGY OF MINNESOTA

MINNEHAHA PARK

Near Fort Snelling, 10,000 years ago, melt water from the Wisconsin glacier was discharged through the Mississippi River and plunged over a ledge of Platteville limestone into a gorge cut chiefly in the St. Peter sandstone. The undercutting action in the soft sandstone caused the limestone ledge to break off with a vertical face, thus maintaining the falls, while causing them to retreat upstream. When the falls in the main channel passed the upper end of the island - where the Soldiers Home now stands - the entire flow in the river was diverted to the main gorge and the falls in the west channel were abandoned. This unique and unusual geological feature, an abandoned waterfall, is located at the north end of the former west channel which lies 200 feet east of this tablet.

The cataract in the Mississippi has migrated to St. Anthony Falls and Minnehaha has retreated from the abandoned channel to its present location where the undercutting action responsible for the migration is apparent.

Erected by the Geological Society of Minnesota
In cooperation with Board of Park Commissioners
City of Minneapolis

GEOLOGY OF MINNESOTA

MILLE LACS LAKE REGION

This part of Minnesota was covered by glacial ice, several thousand feet thick, on at least four occasions during the last million years. As the glaciers moved in from Canada they brought with them enourmous quantities of glacial drift - clay, sand gravel, and boulders of granite and limestone - which was deposited in sheets or in irregular hills and depressions along stationary ice fronts. One such zone, a terminal moraine, formed during the last or Wisconsin Stage of glaciation 10,000 years ago, encircles Mille Lacs on the West and South, from Nichols to Isle, and effectively dams the water to form the second largest lake in the state.

Mille Lacs is 18 miles long and 14 miles wide. Its surface is 1249 feet above sea level and its depth - 30 to 40 feet - is quite uniform throughout. The overflow of the lake is discharged through the Rum River which flows from Vineland to Anoka about 70 miles to the South, where it empties into the Mississippi.

Erected by the Geological Society of Minnesota
In cooperation with the Department of Highways
State of Minnesota

GEOLOGY OF MINNESOTA

LAKE MINNETONKA REGION

Prior to the Great Ice Ages the surface of this region consisted of sandstones and limestones deposited in Cambrian and Ordovician seas several hundred million years ago. Previous to glaciation the drainage was to the south. The principal watercourse, several miles wide, had its headwaters in central Minnesota and extended southeastward, under Lake Minnetonka, to Pine Bend on the Mississippi, 10 miles below St. Paul. In that channel, once a conspicuous feature of the landscape, flowed the ancestral Mississippi.

There were four major epochs of glaciation. The glaciers, 10,000 feet thick at their centers in Canada, moved southward to cover most of the state and filled the pre-glacial valley of the Mississippi with sand and gravel - glacial drift - to a depth of several hundred feet. Lake Minnetonka is perched on that drift, 930 feet above sea level and 400 feet above the rock floor of the valley.

Erected by the Geological Society of Minnesota
In cooperation with the Department of Highways
State of Minnesota

GEOLOGY OF MINNESOTA

ELK RIVER REGION

The glaciers which covered Minnesota at intervals during the last million years brought with them from Canada thousands of cubic miles of rock debris. The sand, gravel, and granite boulders came chiefly from Ontario to the northeast, the limestone and clay from Manitoba to the northwest. When the ice melted, the transported material - glacial drift - was dropped to form a mantle of soil over the glaciated area. It is estimated that the fertility of the soil in Minnesota has been increased by 30 percent by glacial action. The glacial deposits in the Elk River region vary in fertility depending upon the proportions of sand, clay and limestone.

The melt waters from the glaciers tended to collect in streams which flowed away from the ice in a radiating pattern. The Mississippi River at this point is such a stream started during the last or Wisconsin stage of glaciation.

Erected by the Geological Society of Minnesota
In cooperation with the Department of Highways
State of Minnesota

1954 MIDWEST CONVENTION

If interest and enthusiasm are any criterion, the Fourteenth Annual "Meet Me In Milwaukee-Midwest Mecca in '54" Convention of the Midwest Federation of Mineralogical and Geological Societies, to be held in the Civic Auditorium at Milwaukee, Wisconsin, next June 24-25-26, should be one that will be long remembered.

Not only are the members of the Wisconsin Geological Society, official host, working hard in a battery of local committees to get the big 1954 show in readiness, but much interest is being registered by affiliate societies and individuals. Dealers from the East, Midwest and West have contracted for booths to display commercial exhibits including gems and minerals; lapidary equipment and supplies; rare minerals; fluorescent minerals; cut stones and gem materials; diamond saws; unusual cutting equipment; rare ores; books; slides and films on gems; slabs and mounts.

AUCTION: In keeping with past conventions, an auction will be held on Saturday afternoon, June 26, from 3:30 to 5:30 in Kilbourn Hall. The Convention will be nearing its close and the auction will not interfere with dealer business in Juneau Hall. This is an auction of donated material, the proceeds of which will help defray the expenses of the Convention. James O. Montague, General Convention Chairman, requests that you be generous in your donations of material, donating first class specimens only. Jim says "it is better to contribute one real good specimen than a half dozen mediocre ones."

SOUVENIR GUIDE: Each registrant will receive a Souvenir Guide to Noteworthy Geological Sites in Wisconsin and Field Trip Directory. The trips: (1) The Greene Memorial Museum of Paleontology, Milwaukee-Downer College; (2) the Lutz Quarry at Oshkosh, for Marcasite and Pyrite; (3) the Geology Department of the Milwaukee Public Museum, and if enough desire (4) a motorcade to visit Milwaukee's lakeshore beauty spots on Saturday morning, June 26.

TRADING POST: A Convention Feature will be the Trading Post, where you may engage in a friendly bit of "hoss-trading," swapping your surplus materials with others so that all may profit thereby.

PROGRAM: Program Chairman John Mihelcic states that the Educational Program will encompass the earth sciences, as well as gemology and lapidary, and a well-rounded schedule of activities has been completed. High on the list of Convention attractions is a Convention Banquet, highlighted by an outstanding speaker.

WELCOME MAT IS OUT: As Chairman Jim says: "Meet me in Milwaukee-Midwest Mecca in '54. Come with a smile, a happy heart, and a determination to have the time of your life. We will smile right back, lean over backwards, and do our derndest to see that you get it!".

Dr. H. W. Kuhn, Publicity Chairman.

CONVENTION HEADQUARTERS
WISCONSIN HOTEL
720 No. 3rd St., Milwaukee 3 Wis.

In Memoriam

During the past year death has claimed several of our members. One of these was Ralph Hollingsworth, an enthusiastic member for many years.

He was born in Indiana and came to Minneapolis in 1903. He worked for the Soo Railroad for many years. At the time of his retirement he was chief electrical engineer at the power house.

He was an avid student of the Bible, astronomy, ornithology, geology and mineralogy. He enjoyed the geological field trips and especially the two week field trips conducted each summer by the Society.

His classified rock and mineral collection was given to the Crystal Bay High School.

The Society and his many friends shall miss him but he will be long remembered for his genial personality.

To his widow we extend our deepest sympathy.

Mr. H. H. Edgerton passed away recently. He was one of the charter members but during the past few years ill health kept him from attending the meetings. In years past when the Society held its meetings at the Minneapolis Public Library, Mr. Edgerton never missed a meeting.

He will be remembered by the older members of the Society for his eagerness to learn and help newer members to sustain an interest in geology. He was an engineer by profession.

We extend our sincere sympathy to his family.

Maida Wheeler who was a member of the Society several years ago passed away recently.

She was keenly interested in ornithology, botany, astronomy and geology.

She left no family but many friends.

EDITOR'S NOTE

Mr. and Mrs. Henry Sommers took a six months flight around the world in the winter of 1950-51. Starting with the Fiji Islands they visited New Zealand, Australia, Java, Bali, Thailand, Burma, India, Syria, Jerusalem and Lebanon. This flight, in India, was the cluminating experience of all their travels.

THE ROOF OF THE WORLD

by HELEN J. SOMMERS

It started at Darjeeling where we waited ten days in vain for the haze to lift and show us Everest. There Capt. Tarkowski, a Polish flier, said to us, "If you want to see mountains, you should fly to Gilgit. That is the finest flight in the world."

Gilgit - what? - where? Our fiend enlightened us. It is a little town buried deep in the northwest Himalayas, the crossways for caravans from Turkestan, Russia, China and India. While the town lies in Pakistan, the road passes through Kashmir and, since the division of India and Pakistan, has been closed to all traffic, leaving Gilgit practically isolated.

An airlift seemed the only solution and the Pakistan army undertook it. They procured two Dakota freighters. The flight would have to start at Peshawar, which is also the starting-point for the road over the Khyber Pass. 250 miles to the north lay Gilgit. Between were the Himalayan ranges through which the Indus River snaked its way in a deep narrow valley. Gilgit lay in the even narrower valley of a tributary, the Gilgit River.

These were the difficulties to be overcome. To the north lay the high cold plateau of Thibet, to the south the low hot plains of India. Between them the currents of air swirled in constant and unpredictable storms. There were no weather stations, no emergency landing fields, no refueling tanks. The only possible landing place near Gilgit was a tiny meadow at the bottom of a deep valley beside the Gilgit River.The ranges rose to 16,000 feet and right along the course the tremendous mountain, Nanga Parbat, rose two miles above the ranges. The nearest to a safe flight was in a straight line to Gilgit in a plane that could go higher than Nanga Parbat, over 26,000 feet high. The DC-3 could go only to 18,000 and had no oxygen equipment. The only course available was to follow above the winding gorge of the Indus and to fly only in clear weather, trusting that no sudden storm would shut down.

So the airlift was mapped out, English and Polish pilots were secured, the planes were cleared for freight, two flights a day when possible were taken, and no one was allowed to go without a permit.

To return to my husband and me. Having missed Everest, our hearts were set on Gilgit. Keeping a week for it, we reached Peshawar on a Thursday and started at once on the pursuit of the permit. No one in Peshawar could give it and why did we want to go anyway? "To see the high mountains." To see mountains - incredible! Only one man sensed it when he said, "Did you want to see the Roof of the World?" Our hopes rose on hearing an official from Gilgit was in town. After twenty-four hours we succeeded in tracking him down at a hospital where his son was having his tonsils out - only to have him tell us he had no authority to issue a permit, the proper official was at Rawalpindi, over 100 miles away. "If we go there, can we get the permit?" "Well, he's in Karachi just now (seven hours away by plane!) but perhaps his assistant could give it." "Can we telephone to find out?" "Well it's Friday, our Holy day, and the office is closed."

Deciding to take a chance, we hired a car and on Saturday drove by Kim's Grand Trunk Road to Rawalpindi. The assistant was dubious, suspicious. "Why do you want to go?" Finally, softened by our impassioned pleadings, he gave the permit, and on Sunday we drove back to Peshawar, four of our precious days gone. The only comfort was that no plane had been able to fly in that

time because of the weather. With the accumulation of freight, there was no chance for us on Monday's plane, but we were told to come back to the office at ten o'clock Monday morning. When we reached there we were told to come back at three. At three we were told the planes were full for Tuesday. That was just too much for me. "We've come so far. We have only two days more. We've worked so hard to get the permit. Put some passengers off - they can go another day, etc., etc., etc." At last, seeing tears were imminent, the official yielded. "You can go on the eleven o'clock flight." "Please, please, can't we take the six o'clock one, when it is apt to be clearer?" "Well, be here at five."

Believe me, we were there at five, to find a blanketed sky with a clear line over the saw-teeth of the distant white range. Captain Houston, our pilot, beautiful to see in his immaculate white uniform, decided to take off. Hearts pounding, we climbed into the plane. The centre was full of freight, securely lashed down. Along the sides were bucket benches on which sat two or three natives and a few mechanics being taken to Gilgit to repair Monday's plane, which had broken down there. "You two sit here till we get off " said Capt. Houston, pointing out a dark niche opposite the cubby-hole where the radioman sat. There we crouched until the captain called me to the co-pilot's seat and my husband to a box placed between him and me. There we sat in the cockpit, headed toward the high white line ahead. Steeped in Himalayan lore, I was tense with the thrill of it. Suddenly we rose in a great arc and before us lay a white sea, endless, with choppy, pointed waves. Far off on the left rose a higher line. Said the pilot, "The Hindu Kush." A farther line "The Little Pamirs." Wonderful names!

Sensing our overpowering interest, Captain Houston left the regular route and took us on a joyride. "Those peaks ahead we call the Sisters. They are 15,000 feet high. I'm flying between them." Beneath us the pass seemed right under our feet, though it was 1000 feet below. On all sides were white peaks, their ridges of incredible length, knife edged with overhanging cornices and snow covered to the very bottom. Far-off rose a peak of the Karakorums. Then ahead towered an enormous white mass - Nanga Parbat, the mountain on which almost as many have died trying to reach its summit as on all the other great Himalayan peaks combined. The mountains around were three miles high but Nanga Parbat rose two miles above them! I gasped - then gasped again as the plane headed straight for it and right into the great valley up which the German expeditions had attacked the summit. "Rakhiot Peak - the Silbersattel - Rakhiot Glacier" I breathed. Before me rose a vision of the struggling porters, the party within a few hours of the summit, the terrific blizzard and the climbers staggering down, many dying on the way and still lying on those frozen heights. There followed still another vision of a later expedition buried forever under an avalanche. We flew by a mighty precipice, snow-covered, a fluffy white cloud crawling down its side. "An avalanche," exclaimed the captain. "You're lucky. I've waited two years to see one. This is my first." "How slow and small it is," said I. "Slow? Small? It is half a mile wide and going at terrific speed." With no gauge to measure by, how little I had realized the immensity about me. I was as if dazed, breathless, trying to store the flying seconds to keep forever.

When we finally turned, the captain said "Look down." Directly under us was the Rakhiot Glacier, shot through by abyssmal crevasses or broken into peaks of ice like lesser mountains. Down it we flew, then along a gorge with the green Indus far below until we turned to follow up its tributary, the Gilgit River and to land on a tiny meadow under towering walls.

The chief pilot, Capt. Massey, was waiting there for the mechanics we had brought. They set to work to find what was wrong with the disabled plane

while Capt. Massey opened a small box the pilot had brought, mailed from England. It was fishing equipment. The contrast between that Himalayan valley and the childlike rapture with which each hook and fly was greeted was laughable. "That plane shan't be ready till tomorrow. I'm going fishing," he declared and off he rattled in a jeep - an English sportsman.

Two hours later we started back, taking the mechanics and a broken plane part to be welded at Peshawar. This time we took the regular route above the Indus valley. All was clear save that over the peaks far to the left clung a fuzziness like cotton batting. The fuzziness came rapidly nearer, then ahead was a cloud with long streamers dropping into the gorge and the next instant we were tossing in a blinding snow-storm. Would we have to turn back and try for Gilgit or perhaps for the tiny emergency landing at the bottom of the Indus valley? I looked at Capt. Houston. Strong hands on the wheel, steady eyes, quiet face. I could not be uneasy. Driving out of the cloud, we cut across the mountains at a great bend in the river, and drove into driving snow and wind, with ice edging the windshield. All at once, it was rain through which we flew, a beating wind-driven deluge, and we were past the white mountains, over the bleak foothills, till we came down through a sunlit sky to the field at Peshawar, our great moment past.

MINNEAPOLIS
5 MINN.

Mr. Hal E. McWethy
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St. Paul, Minn. 8